CLAIMS

What is claimed is:

1. A computer program stored on a computer-readable medium and containing computer program instructions that direct a computer to monitor the operation of at least one data transformation tool and to automatically record information, from data set manipulation behavior of the at least one data transformation tool, that is descriptive of dependencies inherent in data sets being manipulated.

2. A computer program as in claim 1, where said recorded information is used during subsequent operation of said at least one data transformation tool so as to avoid manipulating a particular data set that the recorded information indicates, in conjunction with other information, would not have changed since it was created or last modified.

3. A computer program as in claim 2, where said other information comprises at least data and time information that reflects when the data set was created or last modified.

4. A computer program as in claim 1, where said data transformation tool comprises a software project building tool, where the data sets being manipulated comprise files, and where the computer program instructions that direct the computer to monitor the manipulation behavior monitor a file system.

5. A computer program as in claim 4, where the computer program instructions that direct the computer to monitor the manipulation behavior monitor and record at least the reading from files, the modification of files and the creation of files.

6. A computer program as in claim 4, where the software project building tool comprises a plurality of sub-tools, where the computer program instructions that direct the computer to monitor the manipulation behavior monitor a file system during operation of each sub-tool and record the information in a dependency table data structure based on at least the activity of the sub-tool in reading from files, modifying files and creating files.

7. A computer program as in claim 6, where there is a dependency table data structure created during operation of each of said sub-tools, and further comprising a combined dependency table data structure that is derived from a plurality of the dependency table data structures.

8. A computer program as in claim 7, where said combined dependency table data structure comprises, for each sub-tool, a record that comprises at least an identification of the data objects read, external data objects read, and data objects created.

9. A computer program as in claim 4, where the project building tool uses the recorded dependency information in order to determine whether individual ones of a plurality of build steps need to be executed based on at least times associated with various input and output files identified by the dependency information.

10. A method to operate a computer, comprising:

monitoring the operation of at least one data transformation tool; and

automatically recording information, from data set manipulation behavior of the at least one data transformation tool, that is descriptive of dependencies inherent in data sets being manipulated.

11. A method as in claim 10, where said recorded information is used during subsequent operation of said at least one data transformation tool so as to avoid manipulating a particular data set that the recorded information indicates, in conjunction with other information, would not have changed since it was created or last modified.

12. A method as in claim 11, where said other information comprises at least data and time information that reflects when the data set was created or last modified.

13. A method as in claim 10, where the data transformation tool comprises a software project building tool, where the data sets being manipulated comprise files, and where monitoring monitors a file system.

14. A method as in claim 13, where monitoring the file system monitors and records at least the

reading from files, the modification of files and the creation of files.

15. A method as in claim 13, where the software project building tool comprises a plurality of sub-tools, and where monitoring the manipulation behavior comprises:

monitoring a file system during operation of each sub-tool; and

recording information in a dependency table data structure based on at least the activity of the sub-tool in reading from files, modifying files and creating files.

16. A method as in claim 15, where there is a dependency table data structure created during operation of each of said sub-tools, and further comprising creating a combined dependency table data structure from a plurality of the dependency table data structures.

17. A method as in claim 16, where said combined dependency table data structure comprises, for each sub-tool, a record that comprises at least an identification of the data objects read, external data objects read, and data objects created.

18. A method as in claim 13, where the project building tool uses the recorded dependency information in order to determine whether individual ones of a plurality of build steps need to be executed based on at least times associated with various input and output files identified by the dependency information.

19. A computer system, comprising:

a processor for executing software that implements a data transformation tool; and

a monitor to monitor the operation of the data transformation tool and to record information obtained from observing data set manipulation behavior of said data transformation tool, the recorded information being descriptive of dependencies inherent in the data sets being manipulated.

20. A computer system as in claim 19, where said recorded information is used during subsequent operation of said data transformation tool so as to avoid manipulating a particular data set that the recorded information indicates, in conjunction with other information, would not have changed since it was created or last modified.

21. A computer system as in claim 20, where said other information comprises at least data and time information that reflects when the data set was created or last modified.

22. A computer system as in claim 19, where the data transformation tool comprises a software project building tool, where the data sets being manipulated comprise files, and where said monitor monitors a file system.

23. A computer system as in claim 22, where said monitor monitors and records at least the reading from files, the modification of files and the creation of files.

24. A computer system as in claim 22, where the software project building tool comprises a plurality of sub-tools, and where said monitor monitors said file system during operation of each sub-tool and records information in a dependency table data structure based on at least the activity of the sub-tool in reading from files, modifying files and creating files.

25. A computer system as in claim 24, where there is a dependency table data structure created during operation of each of said sub-tools, and a combined dependency table data structure that is created from a plurality of the dependency table data structures.

26. A computer system as in claim 25, where said combined dependency table data structure comprises, for each sub-tool, a record that comprises at least an identification of the data objects read, external data objects read, and data objects created.

27. A computer system as in claim 22, where the project building tool uses the recorded dependency information in order to determine whether individual ones of a plurality of build steps need to be executed based on at least times associated with various input and output files identified by the dependency information.

28. A computer system, comprising:

a processor for executing software that implements a software project building tool comprised of a

plurality of sub-tools used for implementing a plurality of build steps;

a memory that stores a file system containing files; and

coupled to said processor and to said file system, a monitor to observe the operation of the software project building tool, said monitor creating a dependency table data structure that is descriptive of at least input and output file dependencies inherent in the operation of said plurality of sub-tools, said software project building tool being responsive to said dependency table data structure to determine whether individual ones of the plurality of build steps are required to be executed based on at least times associated with files identified by said dependency table data structure.

29. A computer system as in claim 28, where said dependency table data structure comprises, for each sub-tool, a record that comprises at least an identification of data objects read, external data objects read, and data objects created.

30. A computer system as in claim 28, where said monitor observes file activity for files representing inputs, intermediate outputs, and outputs of the software project building tool.

31. A computer system as in claim 28, where said monitor is operated each time said software project building tool is operated for updating the dependency information.

32. A computer system as in claim 28, where said dependency information is generated on the fly by

said monitor each time said software project building tool is operated.

33. A computer system as in claim 28, where said monitor uses TSD/FSFD file system monitoring.

34. A computer system as in claim 28, where said monitor uses LD_LIBRARY_PRELOAD file system monitoring.

35. A computer system as in claim 28, where said system is coupled to a data communications network for enabling communication with a user related to operation of at least one of said monitor and software project building tool.

36. A computer system as in claim 28, where said system is coupled to a data communications network for enabling communication with a user so as to provide the user at least with information that is indicative of a content of the dependency table data structure.